WHAT IS CLAIMED IS:

1. A method of forming a $LaNiO_3$ layer comprising the steps of:

(a) coating a substrate with a solution that comprises lanthanum atoms, nickel atoms, and one or more diol compounds to form a material layer;

(b) heating the material layer to a temperature above room temperature and less than or equal to 400 °C for a first period of time; and

(c) heating the material layer to a temperature of 500 °C or more in an oxygen atmosphere for a subsequent second period of time to form a layer of $LaNiO_3$.

2. The method of claim 1 wherein the one of said diol compounds comprises a 1,3-propanediol molecule absent the hydrogen atom of a at least one hydroxyl group of the molecule.

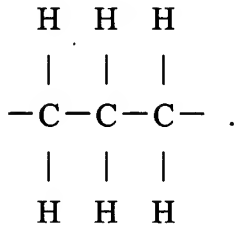
3. The method of claim 1 wherein one of said diol compounds comprises a molecule of one of 1,3-propanediol, 1,4-butanediol, 1,5-pentanediol, and 1,6-hexanediol, absent the hydrogen atom of a least one hydroxyl group of the molecule.

4. The method of claim 1 wherein one of said diol compounds comprises a molecule of a linear diol absent the hydrogen atom of a least one hydroxyl group of the molecule.

5. The method of claim 1 wherein one of said diol compounds comprises a molecule of a linear diol absent the hydrogen atoms of both hydroxyl groups of the molecule.

6. The method of claim 1 wherein the solution comprises at least one chelated complex having at least one lanthanum atom coupled to at least one nickel atom by a group of atoms having the form –O–R–O–, where the at least one lanthanum atom is coupled to one oxygen atom (O), where the at least one nickel atom is coupled to the other oxygen atom (O), and where R comprises at least one CH_2 group.

7. The method of claim 6 wherein R comprises at least the following group of atoms:



8. The method of Claim 1 wherein step (a) comprises dispensing the solution on the substrate and spinning the substrate.

9. The method of Claim 1 wherein step (b) comprises heating the material layer to a temperature over 200°C for at least one minute.

10. The method of Claim 1 wherein step (c) comprises heating the material layer to a temperature over 800°C for at least 10 minutes.

11. The method of Claim 1 wherein step (c) comprises heating the material layer to a temperature over 600°C for at least 10 minutes in a rapid thermal annealing process.

12. The method of Claim 1 wherein step (c) comprises heating the material layer to a temperature over 700°C for at least 10 minutes in a rapid thermal annealing process.

13. The method of Claim 1 wherein step (c) comprises heating the material layer to a temperature over 800°C for at least 10 minutes in a rapid thermal annealing process.

14. A method of forming a solution comprising lanthanum atoms, nickel atoms, and one or more compounds of 1,3-propanediol, said method comprising the steps of:

(a) dissolving lanthanum acetylacetonate in 1,3-propanediol and reacting the components to form a first solution having molecules that include lanthanum atoms and one or more compounds of 1,3-propanediol;

(b) dissolving nickel acetate in 1,3-propanediol and 2,4-pentanedione and reacting the components to form a second solution having molecules that include nickel atoms and one or more compounds of 1,3-propanediol;

(c) combining the first and second solutions and refluxing at a temperature above room temperature.

15. The method of Claim 14 wherein step (a) comprises the step of including an acid in the dissolving solution.

16. The method of Claim 14 wherein at least a portion of step (a) occurs at a temperature above 100 °C.

17. The method of Claim 14 wherein at least a portion of step (b) occurs at a temperature above 100 °C.

18. The method of Claim 14 wherein at least a portion of the refluxing process of step (c) occurs at a temperature above 100 °C.

19. A method of forming a solution comprising lanthanum atoms, nickel atoms, and one or more diol compounds, said method comprising the steps of:

(a) dissolving lanthanum acetylacetonate in a first diol and reacting the components to form a first solution having molecules that include lanthanum atoms and one or more compounds of the first diol;

(b) dissolving nickel acetate in a second diol and 2,4-pentanedione and reacting the components to form a second solution having molecules that include nickel atoms and one or more compounds of the second diol;

(c) combining the first and second solutions and refluxing at a temperature above room temperature.

20. The method of Claim 19 wherein the first and second diols are the same.

21. The method of Claim 19 wherein step (a) comprises the step of including an acid in the dissolving solution.

22. The method of Claim 19 wherein at least a portion of step (a) occurs at a temperature above 100 °C.

23. The method of Claim 19 wherein at least a portion of step (b) occurs at a temperature above 100 °C.

24. The method of Claim 19 wherein at least a portion of the refluxing process of step (c) occurs at a temperature above 100 °C.

25. A lanthanum nickel solution comprising:

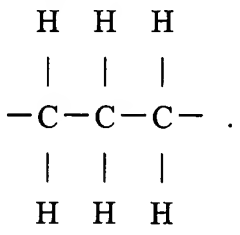
a solvent;

a molecule complex comprising a lanthanum atom;

a molecule complex comprising a nickel atom; and

a diol compound having a first oxygen atom bonded to the lanthanum atom and a second oxygen atom bonded to the nickel atom.

26. The method of claim 25 the diol compound has the form –O–R–O–, where the lanthanum atom is coupled to one oxygen atom (O), where the nickel atom is coupled to the other oxygen atom (O), and where R comprises at least the following group of atoms:



27. A device comprising:

a substrate;

a lanthanum nickel oxidc ($LaNiO_3$) layer formed over the substrate, said lanthanum nickel oxide layer having a non-amorphous microstructure that comprises grains of crystalline material; and

a layer of ferro-electric material formed over said lanthanum nickel oxide layer.

28. The device of Claim 27 wherein average diameter of the grains is in a range from 100 Å to 300 Å.

29. The device of Claim 27 the lanthanum nickel oxidc layer has an average surface roughness in a range from 2 nm to 3 nm.

30. The device of Claim 27 the lanthanum nickel oxidc layer has a resistivity of less than 330 μΩ·cm.

31. The device of Claim 27 the lanthanum nickel oxidc layer has a resistivity of less than 300 μΩ·cm.

32. The device of Claim 27 the lanthanum nickel oxidc layer has a resistivity of less than 250 μΩ·cm.